

## CRITERION 723

## FIRE PUMPS

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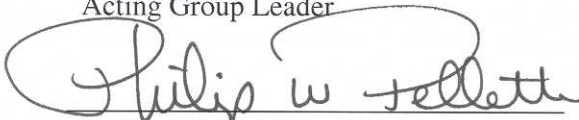
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**RECORD OF REVISIONS**

<b>Revision No.</b>	<b>Date</b>	<b>Description</b>
0	04/30/98	Initial Issue
1	06/19/02	This revision reflects the conversion from a WordPerfect document into a Microsoft Word document and additional clarification on how to develop criteria. This revision includes: <ul style="list-style-type: none"><li>• The addition of a Table of Contents,</li><li>• The use of basis statements in Sections 6, 7, and 9.</li><li>• Revision to Section 9, "Required Documents," and</li><li>• Further clarification in the use of references.</li></ul>
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## **CRITERION 723**

### **FIRE PUMPS**

#### **1.0 PURPOSE**

The purpose of this Criterion is to establish the minimum requirements and best practices for operation and maintenance of fire pumps at LANL.

This document addresses the requirements of LIR 230-05-01(Ref 10.1), "Operations and Maintenance Manual" and the requirements of LIR 402-910-01.4, "LANL Fire Protection Program."

Implementation of these requirements and recommendations satisfies DOE Order 430.1A (Ref. 10.2), "Life Cycle Asset Management," Attachment 2 "Contractor Requirements Document," Paragraph 2, sections A through C, which in part require UC to "...maintain physical assets in a condition suitable for their intended purpose" and employ "preventive, predictive, and corrective maintenance to ensure physical asset availability for planned use and/or proper disposition." Compliance with DOE Order 430.1A is required by Appendix G of the UC Contract.

#### **2.0 SCOPE**

The scope of this Criterion includes the routine inspection, testing and preventive and predictive maintenance of existing LANL fire pumps located at TA-35, TA-53 and TA-55. This Criterion does not address corrective maintenance actions required to repair or replace equipment.

#### **3.0 ACRONYMS AND DEFINITIONS**

##### **3.1 Acronyms**

<b>CFR</b>	Code of Federal Regulations
<b>DOE</b>	Department of Energy
<b>ITM</b>	Inspection, Testing and Maintenance
<b>LIR</b>	Laboratory Implementation Requirement
<b>LPR</b>	Laboratory Performance Requirement
<b>NFPA</b>	National Fire Protection Association
<b>O&amp;M</b>	Operations and Maintenance

<b>PPE</b>	Personal Protective Equipment
<b>PP&amp;PE</b>	Personal Property and Programmatic Equipment
<b>RP&amp;IE</b>	Real Property and Installed Equipment
<b>SSC</b>	Structures, Systems, and Components
<b>SSS</b>	Support Services Subcontractor
<b>UC</b>	University of California

## 3.2 Definitions

**Control Valve**-A valve that controls water flow to a water-based fire protection system.

**Management Level Determination (ML1, ML2, ML3, ML4)**-A classification system for determining the degree of management control applied to facility work. See LIR 230-01-02 for definitions of each ML level.

## 4.0 RESPONSIBILITIES

### 4.1 FWO-Systems, Engineering and Maintenance (FWO-SEM)

- 4.1.1** FWO-SEM is responsible for the administrative content of this Criterion and monitoring the applicability and the implementation status of this Criteria and either assisting the organizations that are not applying or meeting the implementation expectations contained herein or elevating their concerns to the director(s).

*Basis:* LIR 301-00-01.11 ; Issuing and Managing Laboratory Operations Implementation Requirements and Guidance, Section 5.4, OIC Implementation Requirements.

- 4.1.2** FWO-SEM shall provide technical assistance to support implementation of this Criterion.

### 4.2 FWO-Fire Protection (FWO-FIRE)

- 4.2.1** FWO-FIRE is responsible for the technical content of this Criterion and monitoring the proper implementation across the Laboratory.

- 4.2.2** FWO-FIRE shall provide technical assistance to support implementation of this Criterion.

### **4.3 Facility Manager**

- 4.3.1** Responsible for operations and maintenance of institutional, or Real Property and Installed Equipment (RP&IE) under their jurisdiction, in accordance with the requirements of this document.
- 4.3.2** Responsible for operations and maintenance of those Personal Property and Programmatic Equipment (PP&PE) systems and equipment addressed by this document that may be assigned to the FM in accordance with the FMU-specific Facility/Tenant Agreement.

### **4.4 Group Leader**

- 4.4.1** Responsible for operations and maintenance of those Personal Property and Programmatic Equipment (PP&PE) systems and equipment addressed by this document, which are under their jurisdiction.
- 4.4.2** Responsible for system performance analysis and subsequent replacement or refurbishment of assigned PP&PE.

### **4.5 Authority Having Jurisdiction (AHJ) – Fire Marshal**

- 4.5.1** The AHJ is responsible for providing a decision on a specific technical question regarding this Criterion.

### **4.6 Support Services Subcontractor (SSS)**

- 4.6.1** Responsible for providing Inspection, Testing and Maintenance (ITM) of the fire protection systems addressed in this Criterion at the request of the responsible Facility Manager.
- 4.6.2** Responsible for coordinating work with operating group and Facility Manager to conduct ITM in the affected area.

## **5.0 PRECAUTIONS AND LIMITATIONS**

### **5.1 Precautions**

This section is not intended to identify all applicable precautions necessary for implementation of this Criterion. A compilation of all applicable precautions shall be contained in the implementing procedure(s) or work control authorization documents. The following precautions are intended only to assist the author of a procedure or work control document in the identification of hazards/precautions that may not be immediately obvious.

## **5.2 Limitations**

The intent of this Criterion is to identify the minimum generic requirements and recommendations for SSC operation and maintenance across the Laboratory. Each user is responsible for the identification and implementation of additional facility specific requirements and recommendations based on their authorization basis and unique equipment and conditions, (e.g., equipment history, manufacturer warranties, operating environment, vendor O&M requirements and guidance, etc.).

Nuclear facilities and moderate to high hazard non-nuclear facilities will typically have additional facility-specific requirements beyond those presented in this Criterion. Nuclear facilities shall implement the requirements of DOE Order 4330.4B (Ref. 10.3) as the minimum programmatic requirements for a maintenance program. Additional requirements and recommendations for SSC operation and maintenance may be necessary to fully comply with the current DOE Order or CFR identified above.

## **6.0 REQUIREMENTS**

Minimum requirements that Criterion users shall follow are specified in this section. Requested variances and exceptions to these requirements shall be prepared and submitted to FWO-SEM in accordance with LIR 301-00-02 (Ref. 10.4), "Variances and Exceptions to Laboratory Operations Requirements," for review and approval. The Criterion users are responsible for analysis of operational performance and SSC replacement or refurbishment based on this analysis. Laws, codes, contractual requirements, engineering judgement, safety matters, and operations and maintenance experience drive the requirements contained in this section.

### **6.1 Operations Requirements**

#### **6.1.1 Operational Requirements**

Fire pumps must remain operational at all times. A fire pump shall be considered operational when the following conditions are met:

- Water supply and discharge piping paths to the pump are available, open, and in operational condition: suction/discharge valves are open, piping is free of leaks, pump suction and discharge pressure gauges are reading normal, suction water supply reservoir is at least half full and provided with operable freeze protection if needed.

- Normal and back-up power supplies to the pump are available and functioning normally.
- Adequate quantity diesel fuel is available (for a diesel pump).
- Pump controller is in operational condition and functioning normally.
- Batteries are in operational condition and functioning normally:
  - Voltage, charging current, and power indications are normal.
- Pump, engine and batteries and associated subcomponents are in operational condition and are functioning normally.
- System condition supervision is in operational condition and functioning normally (alarm and trouble conditions are appropriately relayed to central alarm station).

### **6.1.2 Weekly Inspection**

Verify fire pump operability by performing system inspection—see Appendix A, Fire Pump Visual Inspection Checklist for complete list of weekly operability requirements.

Basis: NFPA 25, 2002 Edition Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems, Chapter 5.

### **6.1.2 Semi-annual Inspection**

Inspect all control valves associated with fire pumps and fire pump header valves to ensure they are:

- In the proper position.
- Locked or supervised.
- Accessible.
- Furnished with appropriate wrenches.
- Free from external leaks.
- Furnished with appropriate identification, including what system or portion of a system they control.

Basis: DOE approved Equivalency to NFPA 25, Standard for the Inspection, Testing and Maintenance of Water-based Fire Protection Systems.

## **6.2 Maintenance Requirements**

### **6.2.1 Control Valves**

- Clean, repair, or replace internal components of all control valves associated with fire pump headers as necessary in accordance with the manufacturer's instructions.

### **6.2.2 Annually**

- Fully close and reopen each control valve to verify operation, position and supervision (if provided).
- Lubricate each operating system OS&Y valve with graphite.



- Following lubrication, completely close and reopen each valve to test its operation and to distribute lubricant.

Basis: NFPA 25, 2002 Edition Standard for the Inspection, Testing and Maintenance of Water-based Fire Protection Systems Section 12.3.4

### **6.2.3 Check Valves**

- Every 5 years, internally inspect all check valves to verify components operate properly, move freely, and are in good condition.
- Every 5 years, clean, repair or replace the internal components as necessary in accordance with the manufacturer's instructions

Basis: NFPA 25, 2002 Edition Standard for the Inspection, Testing and Maintenance of Water-based Fire Protection Systems, Section 12.4.2

## **6.3 Testing Requirements**

### **6.3.3 Fire Pump**

#### **6.3.3.1 Weekly**

- Conduct a weekly fire pump test in accordance with NFPA 25, Chapter 8. Qualified operating personnel shall be present during the test to observe and record satisfactory performance of the pump driver, controller, and alarms. Include during this weekly test a verification that sufficient water flow through all circulation relief valves after the pump is operating at shutoff pressure to prevent pump overheating.

*Basis:* NFPA 25, 2002 Edition Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems, Chapter 8.

#### **6.3.3.2 Annually**

- Test each fire pump assembly using NFPA 25, Chapter 8 as the accepted process. A representative of FWO-FIRE shall observe the annual pump flow test and utilize the data collected to issue a report on the test results and evaluate using NFPA 25, Chapter 8 requirements to evaluate the pump's performance.
- On diesel-driven fire pumps, verify operation of the speed control governor and operation of the overspeed trip.

*Basis:* NFPA 25, 2002 Edition Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems, Chapter 8

## **6.4 Impairments**

If one or more of the operability requirements listed in Section 6.1.1 are not maintained, follow the actions outlined in Criterion 733, Fire Protection System Impairment Control Program. Following maintenance/repair work but prior to returning the affected fire pump to service, perform visual inspections and annual pump test described above. If piping pressure boundary is breached during maintenance/repair work, flushing and hydrostatic testing per NFPA 24 is also required prior to returning it to service.

*Basis:* NFPA 25, 2002 Edition Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems

## **6.5 Modifications**

Following modifications to any part of fire pump system, and prior to returning system to service, perform visual inspections and annual pump test described above. If piping pressure boundary is breached during maintenance/repair work, flushing and hydrostatic testing per NFPA 24 is also required prior to returning it to service.

*Basis:* NFPA 25, 2002 Edition Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems

## **7.0 RECOMMENDATIONS AND GOOD PRACTICES**

The information provided in this section is recommended based on acceptable industry practices and should be implemented by each user based on his/her unique application and operating history of the subject systems/equipment.

### **7.1 Operations Recommendations**

#### **7.1.1** Operational testing and alarm verification will be conducted by SSS personnel, in compliance with LIR 402-910-01, Section 6.0.

*Basis:* LIR 402-910-01.4, LANL Fire Protection Program

### **7.2 Maintenance Recommendations**

#### **7.2.1** Persons other than SSS Fire Protection Maintenance personnel may conduct visual inspection requirements identified in this document.

## 8.0 GUIDANCE

### 8.1 Operations Guidance

8.1.1 No operations guidance available.

### 8.2 Maintenance Guidance

8.2.1 No maintenance guidance available.

## 9.0 REQUIRED DOCUMENTATION

Maintenance history shall be maintained for fire pumps to include, as a minimum, the parameters listed in the Table 9-1 below:

**Table 9-1 Documentation Parameters**

<b>MAINTENANCE HISTORY DOCUMENTATION PARAMETERS</b>				
<b>PARAMETER</b>	<b>ML 1</b>	<b>ML 2</b>	<b>ML 3</b>	<b>ML 4</b>
<b>Fire Pump Maintenance Activities</b>				
Repair / Adjustments	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
PM Activities	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
<b>Fire Pump Equipment Problems</b>				
Failure Dates	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
Failure Root Cause	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
<b>Fire Pump Inspection Results</b>				
Inspection Date	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
SSC Condition	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>

*Basis:* Documentation of the parameters listed in Table 9-1 above satisfies the requirements of LPR 230-07-00, Criteria 2, (Ref. 10.5) which states; "Maintenance activities, equipment problems, and inspection and test results are documented."

## **10.0 REFERENCES**

The following references, and associated revisions, were used in the development of this document.

- 10.1** LIR 230-05-01.0, Operations and Maintenance Manual.
- 10.2** DOE O 430.1A, Attachment 2 “Contractor Requirements Document” (Paragraph 2, Sections A through C), a requirement of Appendix G of the UC Contract.
- 10.3** DOE Order 4330.4B, Maintenance Management Program, Section 3.4.9.
- 10.4** LIR 301-00-02.0, Variances and Exceptions to Laboratory Operation Requirements.
- 10.5** LPR 230-07-00, Maintenance History, Performance Criteria [2].
- 10.6** LIR 402-910-01.4, LANL Fire Protection Program
- 10.7** NFPA 25, 2002 Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems

## **11.0 APPENDICES**

Appendix A: Fire Pump Visual Inspection Checklist

## **Appendix A**

### **Fire Pump Visual Inspection Checklist**

The purpose of inspection is to verify the pump assembly is in operating condition and is free from physical damage.

The pertinent visual observations specified in the following checklist shall be performed weekly.

#### **1.0 Pump House Condition**

- Heat is adequate, not less than 40°F (4.4°C) [70°F(21°C)] for pump rooms.
- Ventilating louvers are free to operate.
- House is clean, not used for storage.
- Lighting is adequate.

#### **2.0 Pump System Conditions**

- Pump suction, discharge, and bypass valves are open.
- Piping is free of leaks.
- Suction line pressure gauge is calibrated and reading normal.
- System line pressure gauge is calibrated and reading normal.
- Suction water supply reservoir is full.

#### **3.0 Electrical System Conditions**

- Controller pilot light (power on) is illuminated.
- Transfer switch normal pilot light is illuminated.
- Isolating switch is closed – standby (emergency) source.
- Reverse phase alarm pilot light is off or normal phase rotation pilot light is on.

#### **4.0 Diesel Engine System Conditions**

- Fuel tank is at least two-thirds full.
- Controller selector switch is in AUTO position.
- Batteries' (2) voltage readings are normal.
- Batteries' (2) charging current readings are normal.
- Batteries' (2) pilot lights are on or battery failure (2) pilot lights are off.
- All alarm pilot lights are off.
- Engine running time meter is operable.
- Crankcase oil level is normal.
- Cooling water level is normal.
- Electrolyte level and specific gravity in batteries is normal.
- Battery terminals are free from corrosion.
- Water-jacket heater is operating.